

STRATIGRAPHY OF THE CAUSELL BRND
FORT WIGLEY AREA

Hudson's Bay Oil and Gas Company Limited
Calgary, Alberta

G. Dann
October, 1953

AREA: N.W.T.

To: Mr. K.G. Reese
From: F.G. Fox
Date: January 12, 1954
Subject: REPORT BY DANN ON CAMSELL BEND -
PORT WRIGLEY AREA, N.W.T.

Attached hereto is a report entitled "Stratigraphy of the Camsell Bend-Port Wrigley Area", by George Dann. The report, recounting Dann's observations in the area during the summer of 1953, is illustrated by five maps, one cross section, five plates, and seven graphical columnar sections.

The report contains descriptions of the Cambrian, Silurian, Devonian, and Cretaceous formations and points out the problems of correlation between this and adjacent areas. Porous zones in both Devonian and Silurian rocks are described, and certain general structural observations are presented.

Dann recommends the drilling of a well on Wrigley anticline and points out three known porous zones that might be encountered, and also the possibility that reef might be found in the Simpson shale.

In the field Dann was assisted by J.P. Manry, and I am able to say, from my own observations, that both deserve commendation for the good will and determination with which they pursued their work.

F.G. FOX

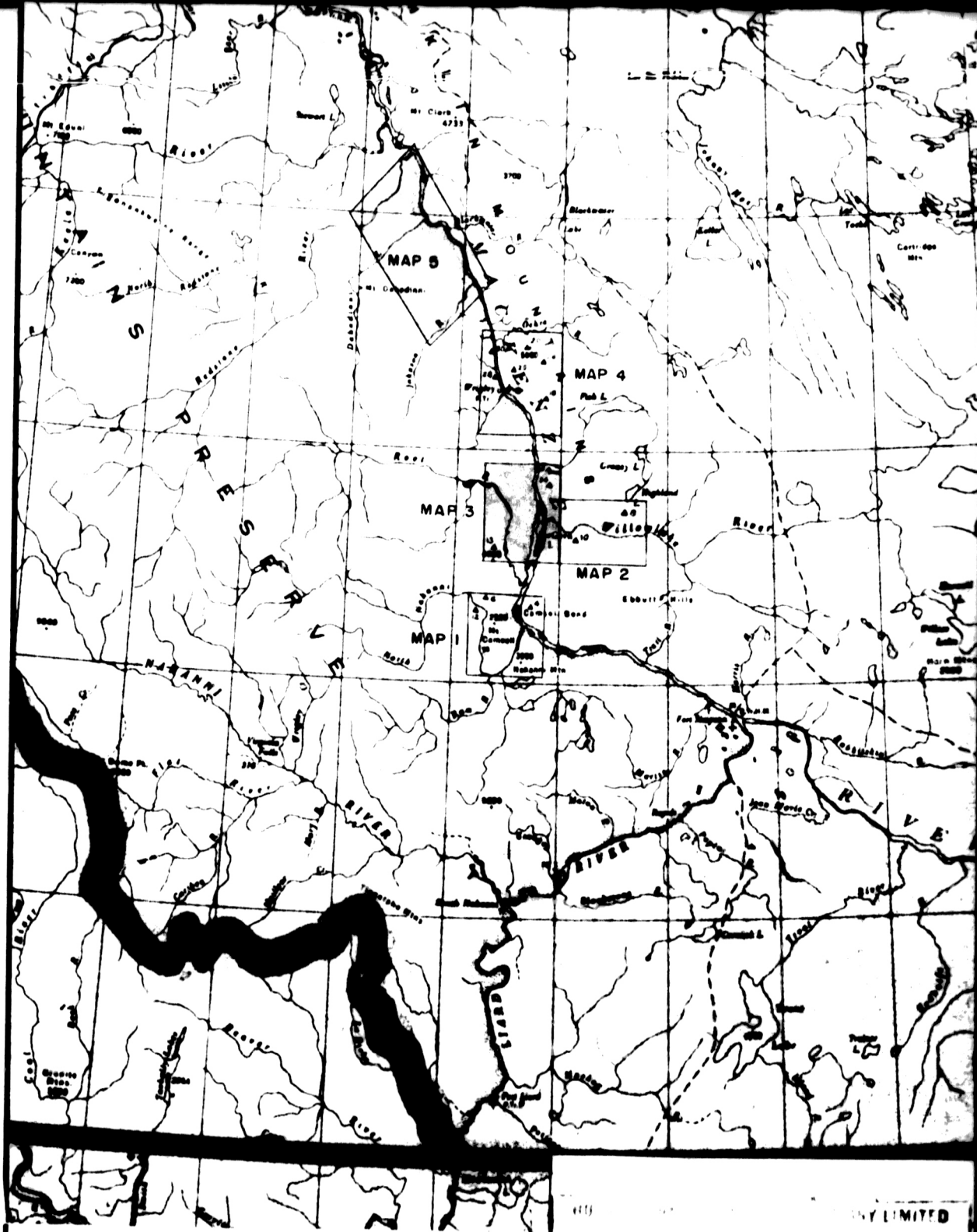
STRATIGRAPHY OF THE CAMSELL HEND FORT WRIGLEY AREA -----

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LEGEND

▲ Trip Numbers

<p>1113</p>		<p>ANY LIMITED</p>	
<p>ALBERTA</p>		<p>ALBERTA</p>	
<p>CAMPELL HEND-FT WRIGLEY-BLACKWATER LAKE</p>			
<p>NORTHWEST TERRITORIES</p>			
<p>INDEX MAP OF REPORT AREAS</p>			
<p>SCALE 1 IN = 40 MI</p>		<p>1953</p>	
<p>G DANN</p>		<p>R 49</p>	

STRATIGRAPHY OF THE CAMSILL BEND FORT WRIGLEY AREA

INTRODUCTION

In 1952, three field parties, under the supervision of Mr. W.R.S. Henderson of British American Oil Company, carried out a program of surface exploration within and adjacent to reservations held jointly by Hudson's Bay Oil and Gas Company Limited and British American Oil Company in the Northwest Territories. In 1953 this work was continued by two field parties under the supervision of Dr. F.G. Fox of Hudson's Bay Oil and Gas Company Limited. The field parties were composed of geologists of Hudson's Bay Oil and Gas Company Limited.

LOCATION OF PROJECT AREA

The area explored during the past season borders the Mackenzie River on both sides from Camsill Bend north to the mouth of the Redstone River. This area has a length, in a north-south direction, of approximately 130 miles and an average width of approximately 35 miles.

TRANSPORTATION

Three modes of transportation were used. For moving the main camp from one site to another along the Mackenzie, the parties were equipped with a large boat and barge. A Beaver seaplane owned by Hudson's Bay Oil and Gas Company Limited and piloted by Mr. Harry Winny was used for weekly food and mail service, for large scale reconnaissance work, and, to some extent, for carrying parties to and from work. A Bell helicopter, which was rented from Associated Airways for the season and which was piloted by Mr. Charles E. Ferber, was used to carry parties to and from work and for small scale reconnaissance (see Plate 1A). Two canoes equipped with outboard engines were also available.

CULTURE

The people of the area are mainly Indians of the Slavi tribe. They are engaged for the most part in trapping. A few white people live in the area and include trappers, Army Signal Corps personnel and a Hudson's Bay Company factor.

The principal settlement in the area is Fort Wrigley, situated on the Mackenzie River about 65 miles north of Camsell Bend. In addition there are several Indian settlements along the Mackenzie.

An Army Signal station is situated near Fort Wrigley at a Canadian Pacific Airlines airport. Weekly scheduled flights are provided during the summer months.

PREVIOUS WORK

A geological reconnaissance of this part of the Mackenzie was first made by R.G. McConnell in 1889. In 1921 a large scale reconnaissance was carried out by G.S. Hume and M.Y. Williams. This work was continued by Hume in 1923. Geologists working on the Canol Project in 1942 and 1943 did considerable work in the area. Since then reconnaissance has been carried out over various parts of the area by parties working for oil companies.

ACKNOWLEDGEMENTS

The writer wishes to express his appreciation for courtesies and assistance extended to him by Hudson's Bay Company post managers, R.C.M.P. Officials, Army Signal Corps personnel, and trappers of the area. Mr. J.P. Manry gave efficient help as assistant geologist.

GENERAL GEOLOGY

Cambrian (?)

At Mount Kindle, which is approximately 14 miles in a northeasterly direction from Fort Wrigley, a thrust faulted fold has exposed a large section of Cambrian rocks. The section measured on the east side of Mount Kindle on Trip 20 is as follows:

Thickness in feet	Lithology
	<u>Mount Cap Formation</u>
425' +	Quartzite, white, pink and deep purple in irregular bands, fine grained, dense, cross bedded, thick bedded to massive, weathers in subdued shades of above colors.
	and
	Sandstone, quartzitic in part, white to various shades of red, composed of medium to coarse grained, subrounded quartz, thick bedded to massive; weathers out, in part, in rude cylinders of varying size, considerable iron oxide in the cement, some intergranular porosity.
425' +	Total observed thickness of partial section.
	<u>Mount Clark Formation</u>
110'	Shale, dark grey, slightly olive grey laminated in part; fissile, brittle, containing hard ferruginous interbands and finely disseminated brown iron oxide within the shale, weathers medium grey.
655'	Shale, light and dark grey laminated, fissile inclined toward platiness, hard, weathers medium grey, with numerous interbands up to three feet thick which are hard and highly quartzitic and/or ferruginous, occasional interbands of white, fine grained quartzite containing considerable ferruginous material.

Thickness in feet	Lithology
10'	Quartzite, greyish-white with red streaks, fine grained, thick bedded, dense, weathers greyish-white, contains black botryoidal hematite in near-surface cavities.
70'	Sandstone, quartzose, light grey, friable, composed of subrounded to subangular quartz grains of variable size with a ferruginous cement, thick bedded, weathers yellowish grey.
2'	Sandstone, as last above but thin bedded and platy.
15'	Quartzite, greyish white with red streaks, fine grained, dense, thick bedded, weathers greyish-white.
20'	Sandstone, quartzose, brown due to iron stain, ferruginous cement in part, variable grain size, subrounded grains, dense, medium to thick bedded, weathers various shades of brown.
25'	Quartzite, greyish-white, with red streaks, fine grained, dense, thick bedded, weathers greyish white, with considerable disseminated brown iron oxide.
<hr/>	
907'	Total observed thickness
 <u>Lone Land Formation (See Plate 6)</u>	
30'	Covered interval.
20'	Shale, hematite red, fairly fissile, with frequent hard quartzitic interbands up to six inches thick, weathers hematite red.
110'	Dolomite, silty, greenish-blue, very fine grained, thin platy bedding, weathers rusty brown, with interbands of greenish-brown shaly material which become very frequent towards the base.
8'	Sandstone, mostly quartzitic with some ferruginous cement in part, pinkish white with reddish-brown mottling

Thickness
in feet

Lithology

due to disseminated iron oxide, variable grain size, grains are subrounded, grades along and across strike into conglomerate which has sandy matrix with variable colored quartz and shale pebbles both rounded and angular.

- 25' Dolomite, and shale as second last above.
- 50' Shale, light and dark grey laminated, slaty habit, hard, brittle, grading along and across strike into yellowish-grey, ferruginous, shale.
- 8' Sandstone, grey, fine grained, composed of well rounded quartz grains with ferruginous cement, medium to thick bedded, weathers dark grey to rusty brown, with abundant paperthin bands of dark, fine grained material parallel to bedding.
- 10' Sandstone, grading into conglomerate as fourth last above.
- 6' Argillite, greenish-grey varying to slightly reddish grey, very fine grained, dense, hard becoming softer towards base, thin bedded, with rare irregular quartz veins and disseminated iron oxide.
- 14' Quartzite, medium grey varying to light grey varying to pink, very fine grained, dense, thick bedded, weathering various shades of pinks and rusty browns, containing, in part thin dark shaly interbands.
- 27' Quartzite, slightly argillaceous, somewhat metamorphosed, grey to greenish grey with dark grey laminations, fine grained, hard, thin bedded, with interbands of dark grey, thinly platy shale and soft, lumpy, yellow, ferruginous shale.
- 102' Quartzite as second last above interbedded with quartzite and shale as last above.
- 10' Shale, slightly silty, hematite red, fissile, fairly hard, weathers deeper red, with disseminated brown iron oxide.
- 25' Interbedded quartzites and shale as second last above.

Thickness in feet	Lithology
10'	Shale, red, as second last above.
31'	Quartzite, argillite and shale as second last above.
120'	Quartzite, white varying to grey, varying to pink, fine grained, dense, thin bedded to medium bedded, weathers light rusty brown. interbedded with Sandstone, quartzitic, white varying to pink, variable grain size becoming almost conglomeratic in part, dense, thin bedded to medium bedded, weathering light brown interbedded with Argillite, greenish grey, fine grained, medium bedded with occasional interbands of red, thinly platy shale. 50' Sandstone, quartzitic in part, ferruginous in part, white to greenish white, variable grain size, dense, medium to thick bedded, weathering greyish white to rusty brown. interbedded with Argillite, greenish-grey, fine grained, dense, thin bedded, weathering rusty brown. interbedded with Shale, hematite red, thinly platy. 12' Sandstone, quartzitic in part, ferruginous in part, argillaceous in part, white to greenish white to pinkish white, variable grain size, dense, thick bedded, weathers varying shades of grey and brown. 3' Argillite, sandy, greenish grey, fine grained, dense, thin bedded, weathers rusty brown. interbedded with

Thickness
in feet

Lithology

Shale, hematite red, thinly platy, hard.

285'

Sandstone, quartzitic in part, ferruginous in part, argillaceous in part, white to greenish white to pinkish white, variable grain size, dense, thick bedded, weathers varying shades of grey and brown.

interbedded with

Argillite, greenish-grey, fine grained, dense, thin bedded.

interbedded with

Shale, hematite red, thinly platy, hard.

Shale becomes increasingly predominant towards 120 feet and below that sandstone becomes increasingly predominant towards base.

420'

Shale, sandy in part, hematite red, chunky to blocky with some inclination towards platiness, hard, weathers deeper red, with frequent thick (1'-3') interbands of hard, hematite red, very sandy argillite and rarer interbands of variable colored, variable grained, impure sandstone and quartzite; heavily copper stained in part, occasional interbands up to three feet of soft, greenish yellow, argillaceous material.

85'

Argillite, greyish-green to grey, thinly platy, hard, brittle, weathers greenish-yellow, with occasional interbands of sandstone, quartzite and red shale as last above.

25'

Shale, red with argillite interbands as second last above.

225'

Interbedded sandy shales and argillite of various shades of grey and green, sandy in part, with some interbands of red shale increasing towards the base.

250'

Shale, sandy in part, hematite red, chunky to blocky with some inclination towards platiness, hard,

Thickness
in feet

Lithology

- weathers deeper red, with frequent thick (1'-3') interbands of hard, hematite red, very sandy argillite and rarer interbands of variable colored, variable grained, impure sandstone and quartzite.
- 80' Argillite, sandy, hematite red varying to dark grey, fine grained, dense, thick bedded, weathers dark red.
- 14' Argillite, sandy and ferruginous in part, green, very fine grained, dense, thick bedded, weathers greenish brown.
- 22' Argillite, sandy, hematite red with thin grey laminations, fine grained, dense, thick bedded, weathers dark red, with numerous small vugs partially filled with malachite crystals.
- 85' Argillite, sandy and ferruginous in part, green with irregular red color bands, very fine grained, dense, thick bedded, weathers greenish-brown, with thin, wavy, irregular sandstone interbands.
- 790' Shale, hematite red, chunky, hard, weathers deeper red.
interbedded with
Argillite, sandy in part, hematite red, very fine grained, medium bedded, weathers deeper red.
At 575' several irregular bands of conglomerate with red ferruginous matrix and well rounded to subangular pebbles, predominately quartz, ranging from 1 mm to 1/4" in size. At 750' several bands of grey, sandy, argillite.
- 65' Covered interval
- 27' Red shale and argillite as above.
- 15' Argillite, calcareous, sandy, green, very fine grained, hard, medium to thick bedded, with thin wavy, light pink streaks roughly parallel to bedding.

Thickness in feet	Lithology
52'	Covered interval.
90'	Shale, hematite red, chunky, hard, weathers deeper red. interbedded with Argillite, sandy in part, hematite red, very fine grained, medium bedded, weathers deeper red.
25'	Transition zone between shale and argillite section above and sandstone section below.
77'	Sandstone, light greyish green, fine grained, dense, vari- able bedding, composed mainly of subrounded quartz grains with considerable iron oxide and probably argillaceous material, weathers dull green and rusty brown.
35'	Red shale with some interbands of sandstone as last above.
53'	Argillite, calcareous, green, very fine grained, hard, medium to thick bedded with occasional interbands of red shale and variable colored sandstone.
150'	Covered interval.
2'	Argillite, calcareous, sandy, grey, very fine grained, medium bedded, with occasional wavy dark grey laminations.
45'	Covered interval.
30'	Shale, green, fissile, brittle, weathers rusty brown, with some interbedded, greenish brown, fine grained, impure quartz sandstone.
170'	Shale, calcareous in part, hematite red, hard, thinly platy, with occasional grey laminations. interbedded with Argillite, calcareous in part, hematite red and green, fine grained, thin bedded.

Thickness
in feet

Lithology

	interbedded with
	Sandstone, quartzose, calcareous, greyish-brown, fine grained, thin bedded, weathers dull brown.
	interbedded with
	Shale, green with brown laminations, platy, brittle, weathers yellowish-green.
300'	Covered interval.
605'	Sandstone, shale and argillite section as above. In top 250' sandstone and green argillite predominate with sandstone decreasing until it is negligible at the base.
150'	Argillite, very calcareous, grey to green, medium bedded with occasional interbeds of red and green shale, contorted and sheared in part.

4,843'

Total observed thickness of partial section.

A short distance to the south of Mt. Kindle the grey shales near the top of the section thin out and disappear. This would indicate an unconformity and the base of the Mt. Cap formation is placed above these shales. The top of the Lone Land is placed at the top of the red and green shale and argillite section. The Mt. Clark and Lone Land formations are assigned Cambrian age on rather sketchy evidence. It may be that they are of Precambrian age. It is of academic interest in this connection that the Mt. Clark and Lone Land formations bear a striking physical resemblance to parts of the great Beltian succession of Waterton Lakes area in southern Alberta.

A few miles to the southwest of Mt. Kindle the above section passes under another mountain. At the base of this mountain on the east side a structureless mass of red and greenish grey, shaly, gypsiferous material was found. M.Y. Williams named this the Saline River formation and placed it in the Ordovician, but later changed his mind and placed it in the Cambrian. It overlies the Mt. Cap formation in the above section and underlies the Franklin Mountain formation of the Lower Silur-

ian. The lower part of the Franklin Mountain is obscured by talus at this point and the contact could not be found.

Ordovician

No rocks of Ordovician age were identified in this area.

Silurian

Silurian rocks occur mainly in the mountain ranges of the area. The Franklin Range in the eastern part of the area consists almost entirely of Silurian strata. To the west of the Mackenzie, the Lone Mountain formation of the Upper Silurian forms the front scarp of the Camsell Range. The Silurian has been divided as follows:

Upper Silurian	-	Lone Mountain (Bear Rock Facies Lone Mountain (Restricted))
Middle Silurian	-	Mount Kindle
Lower Silurian	-	Franklin Mountain

On a mountain about 2 miles southwest of Mount Kindle the following section was measured on Trip 26.

Thickness in feet	Lithology
	<u>Mount Kindle Formation</u>
175'	Limestone, dolomitic, grey, medium to coarsely crystalline, reefy in part with numerous small vugs filled in part with secondary calcite and quartz and pyrite; thick bedded to massive, with abundant corals, gives off fetid odor when struck. FCSILS - N.W.T. '53 - 26 FD1.
55'	Covered interval.

Thickness in feet	Lithology
20'	Limestone, dolomitic, argillaceous, grey, finely crystalline, vuggy in part, thin bedded, rubbly, fossiliferous - brachiopods, weathers yellowish grey. FOSSILS - N.W.P. '53 - 26 PD2.
85'	Covering interval including contact between Mount Kindle and Franklin Mountain formations.
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335'	Total observed thickness of partial section
 <u>Franklin Mountain Formation</u>	
15'	Limestone, dolomitic, silty, light grey, finely crystalline, dense, thick bedded, weathers light grey and medium grey, with coarsely crystalline secondary dolomite, calcite and quartz in irregular veins.
30'	Covered interval.
17'	Limestone, dolomitic, light to medium grey, slightly reddish in part, fine grained, dense, medium bedded, weathers yellowish grey.
22'	Covered interval.
15'	Limestone, dolomitic, brownish-grey, finely crystalline, dense, thin to medium bedded, platy, weathers medium grey to light brownish-grey.
70'	Covered interval.
15'	Limestone, dolomitic, as last above, but slightly reddish in color.
165'	Covered interval.
26'	Limestone, dolomitic, light grey, medium to coarsely crystalline, dense, variable bedding, weathers brownish grey.

Thickness in feet	Lithology
10'	Limestone, dolomitic, silty, light brown with thin grey irregular streaks, finely crystalline, dense, medium bedded, weathers yellowish-brown.
175'	Covered interval.
14'	Limestone, dolomitic, argillaceous, grey, finely crystalline, occasional porosity infilled with secondary calcite, medium bedded, weathers light grey to greyish brown, with some shaly interbands.
40'	Limestone, dolomitic, light grey, reddish in part, finely crystalline with small segregations of coarsely crystalline material, medium to thick bedded, weathers medium grey to yellowish-brown.
10'	Limestone, dolomitic, grey as second last above.
85'	Limestone, dolomitic, medium to dark grey, very finely crystalline, dense, medium bedded, weathers dull grey.
	interbedded with
	Limestone, dolomitic, medium grey, medium crystalline, with occasional vugs, weathers light grey.
1'	Breccia consisting of brown dolomitic siltstone fragments, often lenticular, in a dark grey, dolomitic, sandy matrix, very porous.
55'	Interbedded dolomitic limestone as second last above, brecciated in part, occasional out - and - fill pattern.
47'	Limestone, dolomitic, light grey to olive grey to medium grey, with occasional wavy pinkish bands, finely crystalline, vuggy in small part - vugs usually contain coarse crystals of dolomite and/or calcite, thin to medium bedded, weathers varying shades of grey and yellowish-brown, brecciated in part, 30' from top a narrow band of siltstone breccia.
812'	Total observed thickness of partial section.

The contact between the Mount Findle formation and the Franklin Mountain formation has been placed by the writer below the lowermost fossil bearing strata. The fossils collected above this contact have not yet been identified, but Williams classified them as Niagaran, or Middle Silurian in age. There is a covered interval of approximately 400 feet below the above section and above rocks which were identified as belonging to the Saline River formation of the Cambrian. This interval was littered with fragments of reddish and brownish shaly dolomitic limestone which may be from the "shales" which Williams described as belonging to the Franklin Mountain formation.

Near the southern end of the Franklin Range, where the mountains are cut by River-Between-Two-Mountains, the following section was measured on Trip 33:

Thickness in feet	Lithology
	<u>Bear Rock Facies</u>
50'	Dolomite and dolomitic limestone, dark brownish grey, fine to medium crystalline, dense, almost entirely brecciated, breccia blocks vary in size from infinitesimal to several feet with a limy matrix, breccia is cavernous, overall weathering color is yellowish grey, with considerable secondary calcite and dolomite.
50'	Total observed thickness of partial section.
	<u>Lone Mountain Formation (Restricted)</u>
65'	Covered interval.
105'	Limestone, slightly gypsiferous, dark brownish-grey mottled in part with light yellowish grey, medium crystalline, very porous - pores range in size from infinitesimal to several inches in diameter, massive, weathers mottled greys and yellowish browns, some solution breccias in fractures and on exterior of outcrops, bituminous in part.
80'	Limestone, dolomitic, dark brownish grey, medium crystalline, dense, thin to medium bedded, weathers light grey,

Thickness
in feet

Lithology

	becomes interbedded near base with light brownish grey porous dolomite.
65'	Covered interval.
5'	Dolomite, dark brownish grey, as last above.
90'	Covered interval.
87'	Dolomite, dark brownish-grey as last above, interbedded with light brownish-grey dolomite.
85'	Dolomite, slightly gypsiferous, slightly pinkish light brownish-grey, finely crystalline, dense, medium to thick bedded, weathers dark grey and yellowish brown, occasionally faintly laminated, occasionally slightly brecciated.
85'	Covered interval.
10'	Dolomite, dark brownish grey, medium crystalline, dense, thin to medium bedded, weathers light grey.
25'	Covered interval.
30'	Dolomite, slightly gypsiferous, light grey and dark grey laminated, medium crystalline, dense, medium bedded, weathers light grey, with irregular bands and nodules of light chert, some secondary quartz crystals in fractures, some finely disseminated pyrite throughout rock.
15'	Dolomite, medium grey, coarsely crystalline, dense, medium to thick bedded, weathers dark grey, somewhat friable, with some secondary calcite.
30'	Covered interval.
70'	Dolomite, brownish-grey, medium to coarsely crystalline, porous in part - pores largely infilled with secondary calcite and dolomite, thick bedded, fossiliferous, occasional light chert nodules. FOSSILS - N.W.T. '53 - 33 FDI

Thickness in feet	Lithology
10'	Dolomite, light, slightly pinkish grey, finely crystalline, dense, thin to medium bedded, weathers yellowish grey.
65'	Covered interval.
10'	Dolomite, brownish-grey, medium to coarsely crystalline, porous in part - pores mostly infilled with secondary calcite and dolomite, thick bedded, weathers dark grey.
18'	Covered interval.
18'	Dolomite, brownish grey, as last above.
45'	Covered interval.
55'	Dolomite, brownish grey, as last above.
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1068'	Total observed thickness of partial section.

The above section is placed in the Upper Silurian Lone Mountain formation. The breccia at the top of the section continues upward for several hundred feet and is separated from the overlying Middle Devonian rocks by about fifty feet of coarsely crystalline, reefy dolomite.

About twenty miles northward along the range, the following section was measured on Trip 18:

Bear Rock Facies (See Plate 5A)

345'	Dolomite, dark grey, finely crystalline, almost completely brecciated, breccia fragments range in size from infinitesimal to several feet and are surrounded by a very fine grained, grey, porous, slightly sandy, limy matrix, breccia is very vuggy in part, overall weathering color is dark brownish-grey.
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345' Total observed thickness of partial section.

Thickness in feet	Lithology
	<u>Lone Mountain Formation (Restricted)</u>
119'	Limestone, dolomitic, silty, slightly gypsiferous, medium to light brown, finely crystalline, dense, variable bedding, weathers yellowish-grey, with considerable secondary calcite in fractures, frequently laminated, brecciated in part.
80'	Limestone, dolomitic, slightly gypsiferous, light creamy grey, finely crystalline, dense, variable bedding, weathers yellowish grey, with considerable secondary calcite in fractures, brecciated in part.
31'	Limestone, dolomitic, as second last above.
70'	Limestone, dolomitic, silty, gypsiferous, light grey, finely crystalline, occasional pin-point porosity, variable bedding, frequent reddish streaks and irregular spots, brecciated in part.
80'	Dolomite, gypsiferous, medium grey with fine light grey laminations, very finely crystalline, occasional clusters of fine pores and rare single vugs up to 2" in diameter, variable bedding, occasional fine pyrite cubes, brecciated in small part, weathers various shades of yellow and grey.
50'	Limestone, dolomitic, greyish-brown, medium crystalline, occasional small vugs, medium to thick bedded, weathers light grey to yellowish brown, occasionally grades along strike into coarsely crystalline, porous dolomite.
430'	Total observed thickness of partial section.

The brecciated zone at the top of the above section is believed to be equivalent to the breccia at the top of the River-Between-Two-Mountains section, and is roughly equivalent to the Bear Rock formation of the lower Mackenzie region.

Middle Devonian

The Middle Devonian outcrops in the southern part of the area are restricted to the Camsell Mountains. Here, Middle Devonian crowns the Camsell fault scarp for its entire length. (See Plates 2A and 2B). Some Middle Devonian limestone was observed on the North Nahanni River (See Plate 1B) but was not examined in detail.

From the top of McGern Island northward exposures from the river eastward to the west fringe of the Franklin Range consist of Middle Devonian limestone. The name Ramparts formation, which has been given to the Middle Devonian limestones of the Norman Wells area, has been applied to the entire Middle Devonian sequence in this area. (This usage may not be strictly accurate but it is convenient and will serve until some better name is found). It consists mainly of limestone with frequent coral horizons and occasional shaly interbands. At or near the contact between the Ramparts and the Lone Mountain, wherever it was seen in the area, there is a varying thickness of porous, coarsely crystalline dolomite or calcite.

The only Ramparts sections that the writer examined in detail were in the vicinity of Wrigley, on Trip 28. At Roche-qui-Trompe-a-L'eau, a faulted fold, the following section was measured:

Thickness
in feet

Lithology

Ramparts Formation

130'	Limestone, dark grey, very finely crystalline, dense, variable bedding, weathers light grey, weathers rubbly in part, occasional thin shaly partings with calcite veins cutting the rock at all angles, fossiliferous, zone of abundant brachiopods 105' from top. FOSSILS - N.W.T. '53 - 28 FD3.
10'	Limestone, grey, medium to coarsely crystalline, dense, thin bedded, platy, weathers light grey.
215'	Limestone, dark grey as second last above with a 20' band of shaly thin bedded material from 120' to 140'.
2'	Limestone, grey, reefy, composed entirely of corals. FOSSILS - N.W.T. '53 - 28 FD4.

Thickness in feet	Lithology
1'	Limestone, fossil fragmental, coarse grained, with fine grained dark grey limestone matrix. FOSSILS - N.W.T. '53 - 28 FD4.
0.2'	Thin band composed entirely of bryozoa. FOSSILS - N.W.T. '53 - 28 FD4.
20'	Limestone, dark grey, finely crystalline, dense, variable bedding, weathers light grey, weathers rubbly in part, with a few thin shaly partings.
<hr/>	
248'	Total observed thickness of partial section.

The fault zone lies directly below the above section and here the rock becomes highly contorted and crumpled. It is composed mainly of secondary calcite with occasional wavy interbands of grey limestone. Several selenite crystals and pieces of limestone breccia were found in the talus. Most of this material is obscured by limy material which is being deposited by numerous hot springs.

Approximately 3 miles upstream from Roche-qui-Trempe-a-l'eau on the same side of the river, the following section was measured:

Ramparts Formation

115'	Limestone, dark grey, finely crystalline, dense, thick bedded, weathers medium grey, contains abundant recrystallized calcite in irregular veins, with occasional shaly partings, fossiliferous, very fossiliferous zone 15' from top. FOSSILS - N.W.T. '53 - 28 FD1.
------	--

115'	Total observed thickness of partial section.
------	--

On a small island about a mile-and-a-half upstream from Wrigley 275' of limestone similar to that in the above section was measured. It contained a narrow zone of pelecypods and large ammonites 140' from the top, and a zone of tetracorals 255' from the top.

Upper Devonian

In this report the sub-divisions of the Upper Devonian as devised by Hume are used. They are as follows:

- D7 Third Shale Zone: Dark grey shale.
- D6 Athyris - angelica Zone - 175'+
Brownish-grey fossiliferous limestone with some shale interbands.
- D5 Second Shale Zone - 1475'
Greenish-grey and purplish-red fossiliferous shale with some limestone.
- D4 Leiorhynchus Zone - 800'+
Brownish grey, soft, shaly, fossiliferous limestone with some shale interbands and a highly variable sand content.
- D3/D2 Simpson Shale - Fort Creek Shale
The Simpson shale was found to vary considerably in lithology from locality to locality, but in general it is a grey to greenish grey fissile shale at the top grading into a dark grey to black platy shale at the base with varying silt and lime content. In the northern part of the area the Fort Creek Shales, which are black bituminous shales, are equivalent to at least part of the Simpson shale. No Fort Creek shale was examined in outcrop by the writer.

At the foot of the Camsell Range scarp west of the Root River the following section, presumably faulted, was measured on Trip 13:

Thickness in feet	Lithology
	<u>D7 - Third Shale Zone</u>
280'	Shale, dark grey, very slightly greenish in part, chunky with rhombohedral cleavage, weathers

Thickness
in feet

Lithology

medium grey and yellowish-brown, with some
iron stain.

270' Covered interval.

550' Total observed thickness of partial section.

D6 - Athyris angelica Zone

70' Limestone, slightly brownish-grey, medium crystalline,
dense, hard, thin to medium bedded, undulating
bedding planes, weathers yellowish-brown, con-
tains considerable secondary calcite in joints
and fractures, fossiliferous, with a few shaly
interbands.

FOSSILS - N.W.T. '53 - 13 PD1

80' Covered interval.

16' Limestone as above.

166' Total observed thickness of partial section.

200' Covered interval containing Fault.

D7 - Third Shale Zone

6' Shale, dark grey, chunky with rhombohedral cleavage,
weathers medium grey and yellowish brown.

1025' ± 50' Covered interval.

10' Shale, dark grey, fissile, weathers various shades of
light grey and yellow, considerably iron stained,
contains a few thin hard limy bands which are
coated with brown iron oxide.

250' Covered interval.

Thickness in feet	Lithology
40'	Shale as last above.
750'	Covered interval.
100'	Shale, as last above, but with a few thin light grey laminations.
220'	Covered interval.
95'	Shale, as last above.
120'	Covered interval.

2516' \pm 50' Total observed thickness of partial section.

D6 - Athyris angelica Zone

45'	Limestone, slightly brownish-grey, medium crystalline, variable bedding, undulating bedding planes, weathers yellowish-brown, contains considerable secondary calcite, fossiliferous. FOSSILS - N.W.T. '53 - 13 PD2.
-----	---

45' Total observed thickness of partial section.

The postulation of a fault in the above section was based on lithological and faunal evidence which indicated the repetition of the D6 and D7 formations. More accurate identification of collected fossils may confirm this postulation.

The true thickness of the D7 shale zone is difficult to determine as considerable repetition within the shale itself due to smaller faults may be possible. Evidence of such repetition could be hidden by the large covered intervals. Pronounced crumpling in this shale was observed near the top of the section (See Plate 4B).

On Trip 6 the following section, occurring just north of the North Nahanni River on the east limb of a north-south trending anticline, was measured (See Plate 3A):

Thickness
in feet

Lithology

D6 - Athyris angelica Zone

60' Limestone, slightly brownish-grey, fine to medium crystalline, dense, thin to medium bedded, bedding planes undulating weathers yellowish-brown, contains some secondary calcite and finely disseminated brown iron oxide in joints, with shaly lenses becoming more frequent towards base, fossiliferous.
FOSSILS - N.W.T. '53 - 6 FD1.

20' \pm 5' Covered interval.

80' \pm 5' Total observed thickness of partial section.

D5 - Second Shale Zone (See Plate 3B)

415' Shale, dark purplish-red becoming greenish-grey in part towards base, fissile, weathers dark reddish-brown, with abundant brown limestone bands becoming less frequent towards base, fossiliferous.
FOSSILS - N.W.T. '53 - 6 FD2 Bag 1.

10' Red and greenish grey shale as above interbedded with shaly, brownish grey, unfossiliferous limestone.

190' Shale, greenish-grey, reddish-grey in part, fissile, weathers greenish-grey, with rare hard limy bands, fossiliferous.
FOSSILS - N.W.T. '53 - 6 FD2 Bag 2.

50' \pm 10' Covered interval.

32' Shale, greenish grey, fissile, weathers slightly greenish grey.

200' \pm 25' Covered interval.

550' Shale, calcareous in part, greenish grey, fairly fissile becoming very fissile towards base, weathering light grey, with interbeds of slightly argillaceous limestone becoming predominant between 355' and 400' from top.

Thickness in feet	Lithology
3'	Purplish red, fine grained, variable bedded fossiliferous argillaceous, sandy, limy material. FOSSILS - N.W.T. '53 - 6 FD3.
30'	Shale, greenish grey, fissile, weathering light grey, with numerous grey limestone interbeds.
<hr/>	
1480' ± 35'	Total observed thickness

D4 - Leiorhynchus Zone

260'	Limestone, with very sandy and micaceous streaks, impure, brownish grey, medium crystalline, soft, dense, variable bedding, weathers various shades of browns and greys, with frequent grey or greenish grey shaly interbands, fossiliferous. FOSSILS - N.W.T. '53 - 6 FD4.
2'	Purplish red, argillaceous, limy, sandy fine-grained material.
20'	Limestone, as second last above.
510'	Limestone, very impure, with streaks of clay material, brownish-grey to light brown, medium crystalline, occasionally has granular appearance, dense, soft, variable bedded becoming very shaly towards base with numerous lenses and thin interbeds of fine grained, green, argillaceous material, fossiliferous. FOSSILS - N.W.T. '53 - 6 FD5.

792'	Total observed thickness of partial section.
------	--

The contact between the D4 and the D5 in the above section was arbitrarily placed at the foot of the shale section. However, it is a gradational contact and may actually belong higher in the section

above the three foot band of red, argillaceous, fossiliferous material. The position of the contact may be more accurately defined when the fossils from the red band have been identified.

Owing to the precipitous nature of the D4 outcrop, that part of the section could not be examined in as much detail as was desired.

A D3 section occurring on the opposite side of the North Mahanni on the east limb of the same anticline and separated stratigraphically from the above section by an immeasurable covered interval, was examined on Trip 12 (See Plate 4A). It comprises the following strata:

Thickness in feet	Lithology
<u>D3 - Simpson Shale</u>	
120'	Shale, slightly micaceous, medium to dark grey, slightly greenish in part, calcareous in part, hard, chunky with some rhomboidal cleavage, weathers light grey.
45'	Shale, dark grey, fissile, hard, occasional cone-in-cone, weathers medium grey.
275'	Shale, medium to dark grey, slightly greenish grey in part, hard, chunky becoming fissile towards base, rare hard limy bands.
190'	Shale, micaceous, dark grey to dark brownish-grey, slightly olive-grey in part, fissile, weathers light brownish grey with numerous thin lenses and interbands of hard limy material.
105'	Shale, dark grey to black, hard, platy, weathers brownish-grey, exterior of outcrop stained yellow in part, becomes calcareous and increasingly hard towards base, lower ten feet contains numerous thin interbeds of dark grey, finely crystalline limestone.
<hr/>	
945'	Total observed thickness of partial section.

--- Upper-Middle Devonian Contact ---

Thickness
in feet

Lithology

Ramparts Formation

10' + Limestone, dark grey, finely crystalline, dense, thick bedded, weathers medium grey, fossiliferous.
FOSSILS - N.W.T. '53 - 12 FD1.

The contact between the Simpson Shale Formation and the Ramparts in the above section is conformable and somewhat gradational in that thin beds of Ramparts - type limestone appear in the lowermost ten feet of Simpson. The actual contact however between the shale section and the limestone section is sharp and well defined.

Two Upper Devonian outcrops, one of D3 Simpson Shale and the other of D4 Leicorynchus Zone limestone, were examined about 40 miles further north on the west bank of the Mackenzie River on Trip 30. The Simpson Shale outcrop consisted of about 300 feet of greenish-grey, fissile shale weathering dark greenish grey and brownish-red with frequent thin hard limy bands, occasional beds of fossil fragmental limestone, rare interbands of dull grey, silty, partly calcareous material and occasional small ironstone concretions. Fossils from this outcrop are in N.W.T. '53 - 30 FD1. The D4 outcrop consists of 30 feet of brownish-grey, medium crystalline, dense, soft fossiliferous limestone weathering dull grey. Fossils are in N.W.T. '53 - 30 FD2.

Cretaceous

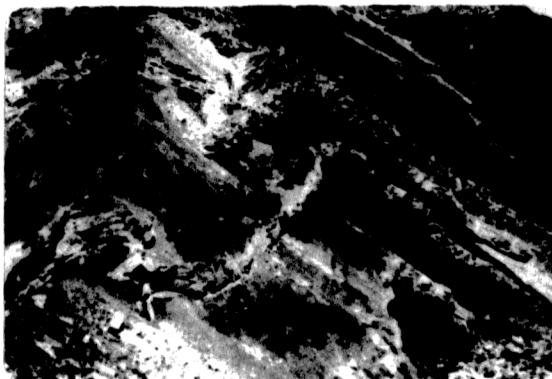
Cretaceous rocks occur only in the northeastern part of the map area and were not examined in detail although some outcrops were observed during a structure mapping project which was carried out in that region. In the Dahadiinni and Redstone Rivers area the Cretaceous consists of grey sandstone varying from fine grained to conglomeratic and grey shale containing ironstone concretions, fossilized wood and a few coal seams.

REGIONAL STRUCTURAL FEATURES

Franklin Range

The Franklin Range begins north of the Willow Lake river east of the Mackenzie. Here it is a south plunging anticline. Further to the north it widens out to a broad arch and is complicated by several thrust faults, the most notable of which extends northward from just north of the River-Between-Two-Mountains to the Ochre River and has its maximum displacement at Mount Kindle where over 6000 feet of Cambrian beds are exposed. Below the fault at Mount Kindle crumpled and overturned Middle Cambrian and Silurian beds were observed (See Plate 6).

PLATE 6



Drag fold and minor fault in Lone Land formation, at base of Mount Kindle

To the west of the Franklin Range are several north trending undulating folds which cause a low foothill topography.

Camsell Range

The Camsell Range for the most part appears to be a simple thrust block in which Upper Silurian and younger strata have been thrust over Upper Devonian shales and limestones (See Plate 2A). In some localities, however, the rocks were found to be folded into an anticline which is asymmetric to the east (See Plate 2B).

The east face of the Camsell Range is a steep scarp which rises abruptly to as high as 3000 feet from the more or less flat plain which borders the Mackenzie on the west. The scarp extends northward from near the North Nahanni River to just south of Wrigley where it disappears. It reappears to the northwest, crosses the river at Roche-Qui-Trempe-a-L'eau and continues for a few miles in a general northeasterly direction before dying out against the Franklin Mountains. Behind the front scarp, to the west, the mountains are caused by north-trending folds which extend northward to the Redstone-Dahadinni rivers area.

Root River Anticline

In the Root River area a north trending anticline occurs in Upper Devonian rocks. The exact nature of this anticline towards the north is not known, although Henderson¹ has offered several theories in his 1952 report.

Detailed Structure in Dahadinni River Area

A structural reconnaissance project was carried out by the writer in an area bounded on the north by the Redstone River, on the south by the Johnson River and on the east by the Mackenzie River. The western boundary of the area roughly parallels the Mackenzie River at a distance of approximately twenty miles.

The principal structural feature of the area is the "Wrigley Anticline" which Paskevich mapped to the south and which the writer has tentatively extended northward to beyond the Redstone river. This anti-

¹ Henderson, W.R.S., Geological Report on a Portion of the Northwest Territories, 1952.

cline trends generally in a northwesterly direction. Several other folds are present in the area. All of them trend northwesterly and, in general, appear to plunge in that direction. The folding is quite gentle in the eastern part of the area but steepens up and becomes more intense toward the west. Where accurate dips were obtainable they indicated that the folds are more or less symmetrical. Steep dips were noted in Cretaceous shales on the west limb of the "Wrigley Anticline" on Redstone River, but this may be due to slumping.

No evidence of faulting was found in the area.

CONCLUSIONS

Cambrian

As the Cap Mountain section was the only Cambrian section examined in the Northwest Territories project, no correlations can be made by the writer. Hume and Link¹, in the Canol Report, correlate the Mount Cap and Saline River formations with the MacDougall Group in MacDougall Creek Valley further north. No economic importance, as far as oil is concerned, can be attached to the Cambrian in this area.

Silurian

A marked difference in lithology and fossil content is noted between the Silurian section examined in the Nahanni and Camsell ranges and the section as seen this summer in the Franklin Range. The massive, brecciated dolomite and underlying bedded dolomite measured near the south end of the Franklin Range is taken to be the equivalent of the Lone Mountain formation which has been seen in the Camsell Range and examined in detail at Little Doctor Lake. However no brecciated zone was discovered in the Camsell or Nahanni Range and the typical

¹ Hume and Link, Canol Geological Investigations in the Mackenzie River Area, Northwest Territories and Yukon, Geological Survey of Canada, Paper 45-16.

rhythmic banding of the Lone Mountain dolomite is absent in the Franklin Mountains section (See Plates 2A and 5A).

Below the Lone Mountain formation, the coralliferous dolomitic limestone of the Mount Kindle formation is not found at Little Doctor Lake, and conversely, the sandstone section in the No. 2 formation at Little Doctor Lake is not found in the Franklin Range. There is a possibility, however, that the narrow silty breccia band found in the Franklin Mountain formation at Mount Kindle is a remnant of the clastic sand section at Little Doctor Lake.

This lack of correlation between the two sections indicates rapid environmental changes between the two areas of deposition. There is also the possibility, as the writer mentioned in last year's report, that the fault blocks of the Nahanni and Camsell Range have moved a great distance, thus making the present marked lithologic and faunal changes over a short distance more feasible.

The vuggy, brecciated zone found at the top of the Lone Mountain formation in the Franklin Mountains would serve as an excellent reservoir in the northern part of the area where it underlies Devonian and Cretaceous rocks. Further porosity in the Lone Mountain was noted below the breccia zone and might provide additional reservoir.

Middle Devonian

The Middle Devonian is easily recognizable throughout the area by its lithologic character and by its fossil content. It is also very similar to Middle Devonian which was examined at Little Doctor Lake and on top of the Camsell range. No porosity was discovered by the writer, but Paskevich reports good porosity in some Ramparts outcrop near the southern end of Franklin Range. A large sinkhole in the Middle Devonian in this locality indicates a collapse which is probably due, in part, to underlying porosity (See Plate 5B). If this porosity were to occur elsewhere under favorable conditions it might prove to be good reservoir rock. The reefy, coarsely crystalline dolomite at the base of the Ramparts was very porous wherever encountered in this area and in the Nahanni Range last year. While its thickness is variable it would undoubtedly prove to be a good reservoir for oil or gas.

Upper Devonian

It has been found that, although the Simpson Shale is quite easily recognizable anywhere in the area, it varies considerably in certain properties such as silt and lime content from place to place, indicating rapid facies changes throughout the area. A marked change in lithology occurs to the northeast of the area where the typical Simpson Shales are replaced by the Fort Creek which probably underlies much of the northern part of the area as well. The reef which produces oil at Norman Wells lies within the Fort Creek shale and there is a possibility that further reef development may take place, possibly within the map area. Such reef development would provide an adequate oil reservoir.

The D4 Leiorhynchus zone, where examined in the North Nahanni River and in the Dahadinni River area, did not appear to contain the abundance of Leiorhynchids which characterizes this formation along the Mackenzie River and in the Root River area. In the North Nahanni River region and on the Mackenzie River north of Wrigley, the Leiorhynchus zone was found to have a high sand content. This part gives some justification for the correlation of the Leiorhynchus zone, with Imperial sandstone formation to the north. While there are possibilities of reef development in the Leiorhynchus zone, it is too near surface even in the northern part of the area to be considered as a good prospective zone for oil exploration.

The D5, D6 and D7 formations were examined only in the southwest part of the area and are not present further north.

RECOMMENDATIONS

Measured dips on the Johnson River indicate a closure, in part at least, of the Wrigley Anticline in that area. As there are several zones of good reservoir rock underlying this structure, the writer recommends the drilling of a test hole on this anticline.

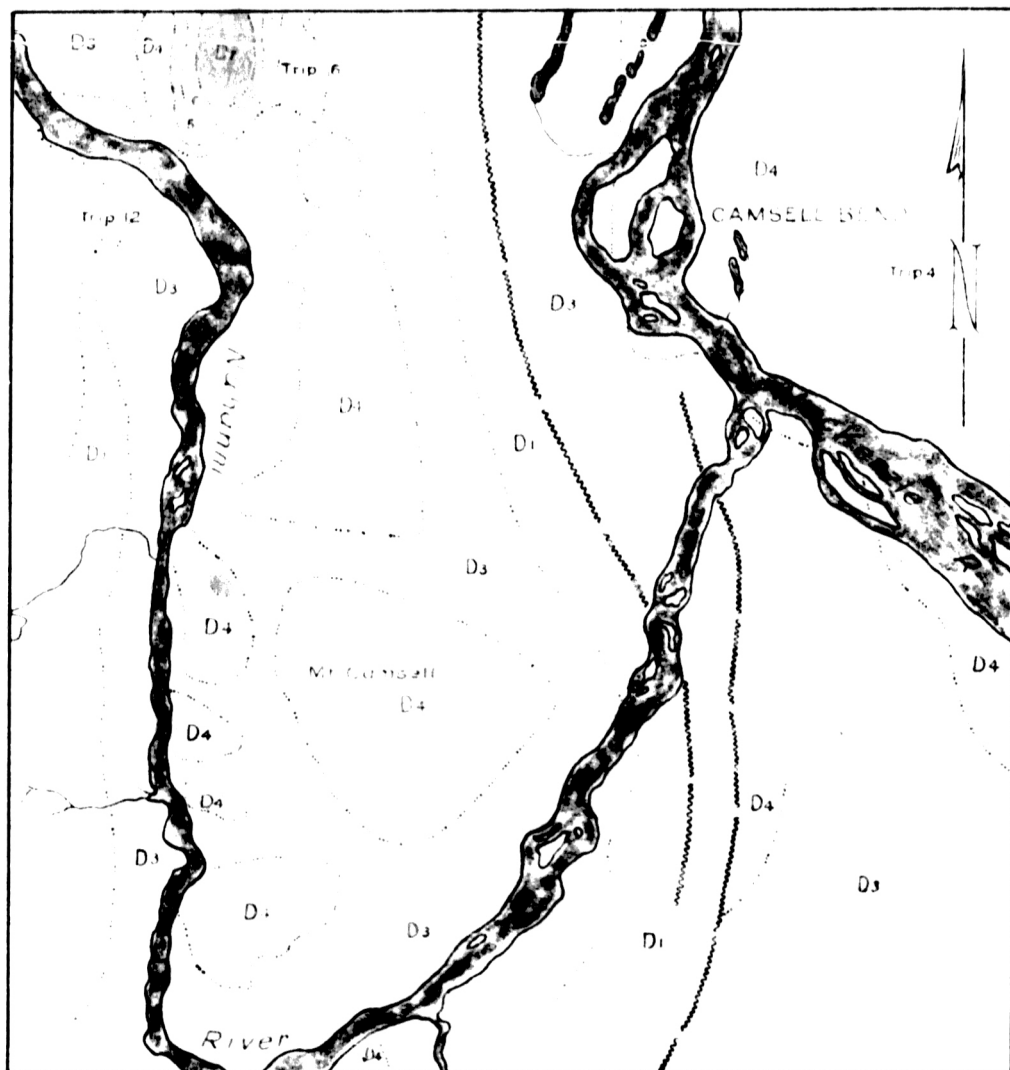
The porous zones that would possibly be encountered in a test hole drilled in this locality are as follows (estimated thicknesses are given where possible):

1. Possible reef in the Simpson Shale/Fort Creek Shale.
2. Porous zones within the Ramparts formation, if any.
3. Reefy dolomite and calcite at the base of the Ramparts: 10' - 200'.

4. Porous Breccia at the top of the Lone Mountain formation: 400' - 500'.
5. Porous Dolomite below breccia: 100' \pm

The lowest zone listed above would probably be at a depth of slightly in excess of 5000'.

GEORGE DANN



- LEGEND**
- | | |
|--------|-------------------------|
| | Dark Shale (D7) |
| | Athyris angelica (D6) |
| U DEV. | Gray and Red Shale (D5) |
| | Leiorhynchus (D4) |
| | Simpson (D3) |
| M DEV. | Ramparts (D1) |

SYMBOLS
 Geological Contact
 Fault

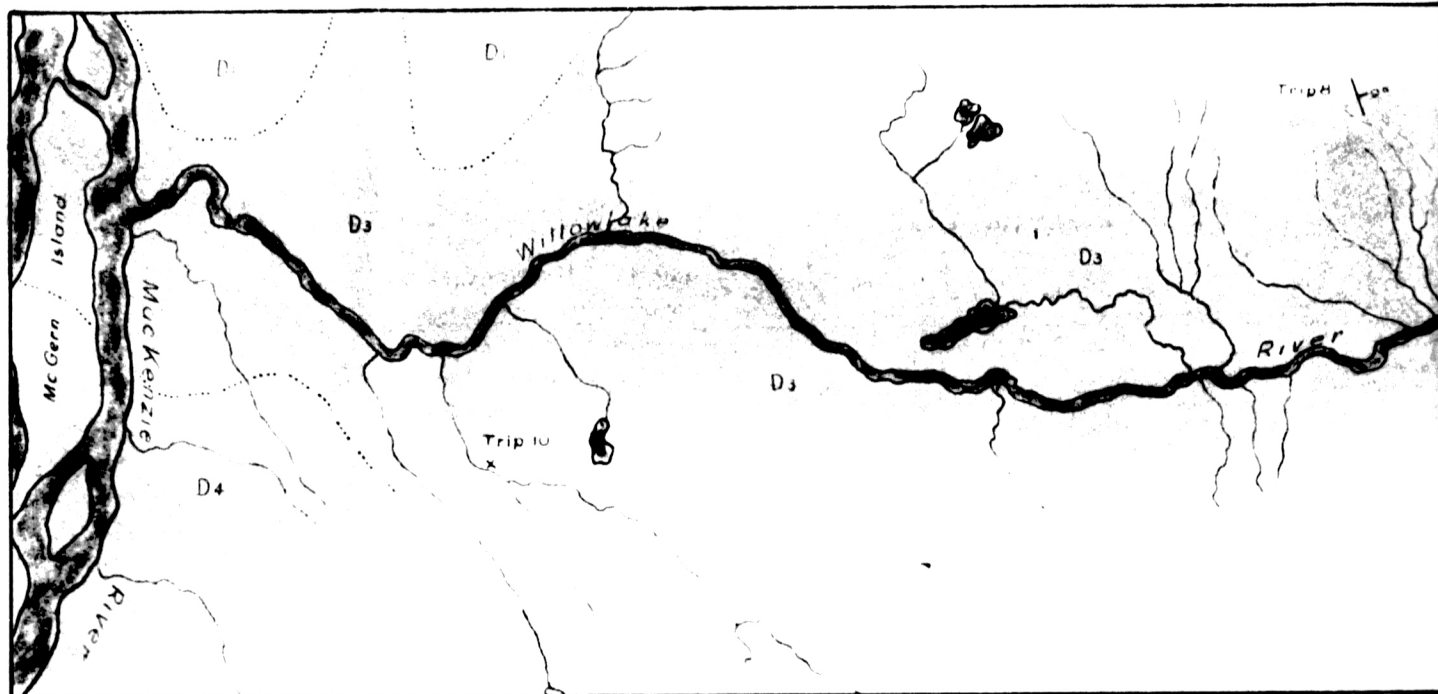
HUDSON'S BAY CO. AND LEICESTER COUNTY LIMITED
 A. D. B. 1953

MAP SHOWING
 CAMSELL BEND AREA
 LOCATIONS OF TRIPS 4, 6 and 12
 MAP NO. 1
 SCALE 1 INCH = 4 MILES

1953

G. DANN

R490



LEGEND

U DEV		Leiorhynchus (D4)
M DEV		Fort Simpson (D3)
		Ramparts (D1)

SYMBOLS

Geological Boundary

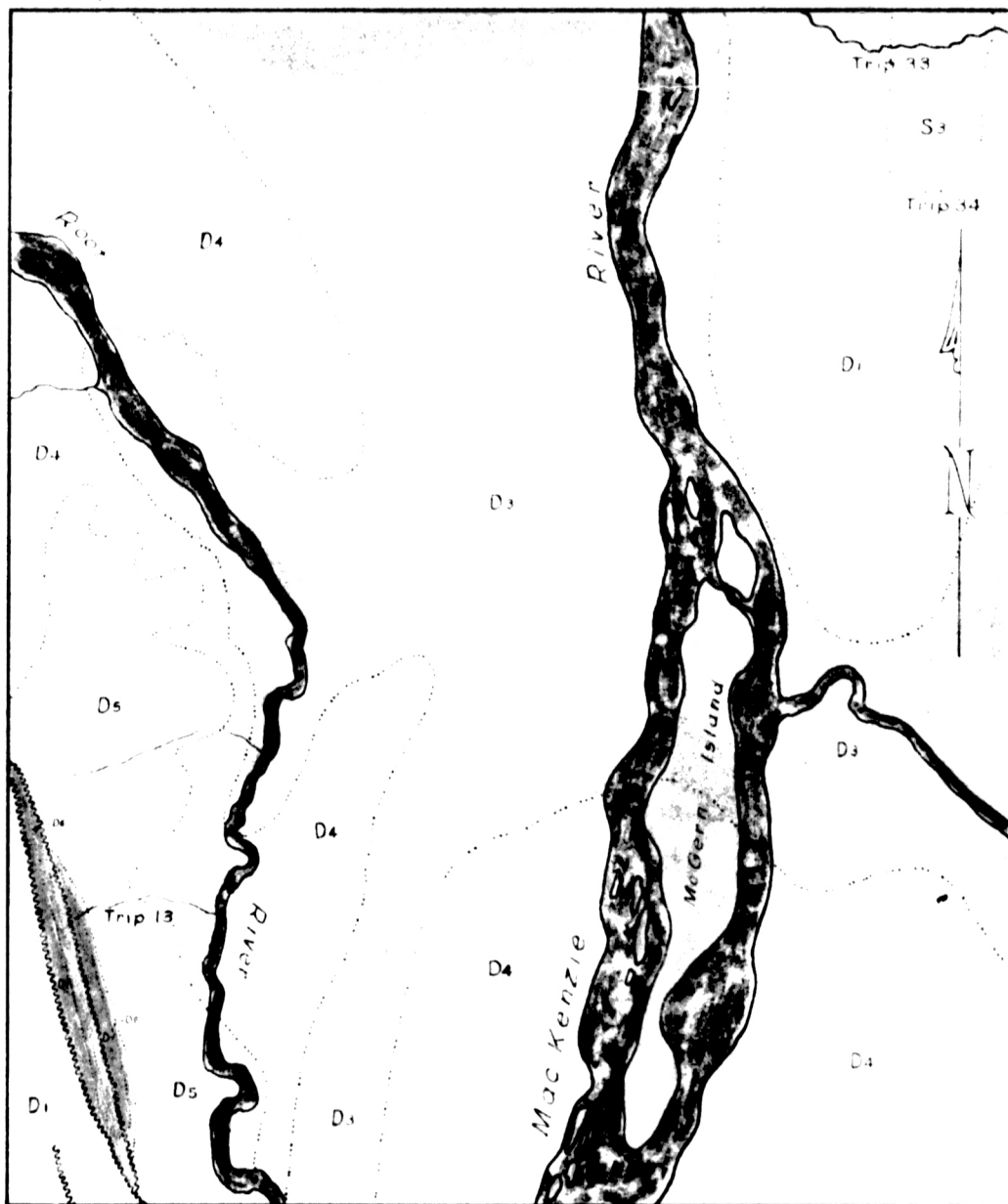
HUGHES BAY DISTRICT AND G.P.S. DISTRICT
 ALBERTA

MAP SHOWING
 WILLOWLAKE RIVER AREA
 LOCATIONS OF TRIPS 8 and 10
 MAP NO 2
 SCALE 1 INCH = 4 MILES

1953

G DANN

R 496



LEGEND

- | | |
|-------|-------------------------|
| | Dark Shale D7 |
| | Athyris angelica (D6) |
| U DEV | Gray and Red Shale (D5) |
| | Leiorhynchus (D4) |
| | Simpson (D3) |
| M DEV | Ramparts (D1) |
| U SIL | Lone Mt S3 |

SYMBOLS
 Geological Contact
 Fault

MUSKIE RIVER AND GAS COMPANY LIMITED

ALBERTA

MAP SHOWING
 MCGERN ISLAND ROOT RIVER AREA
 LOCATIONS OF TRIPS 13, 33 and 34

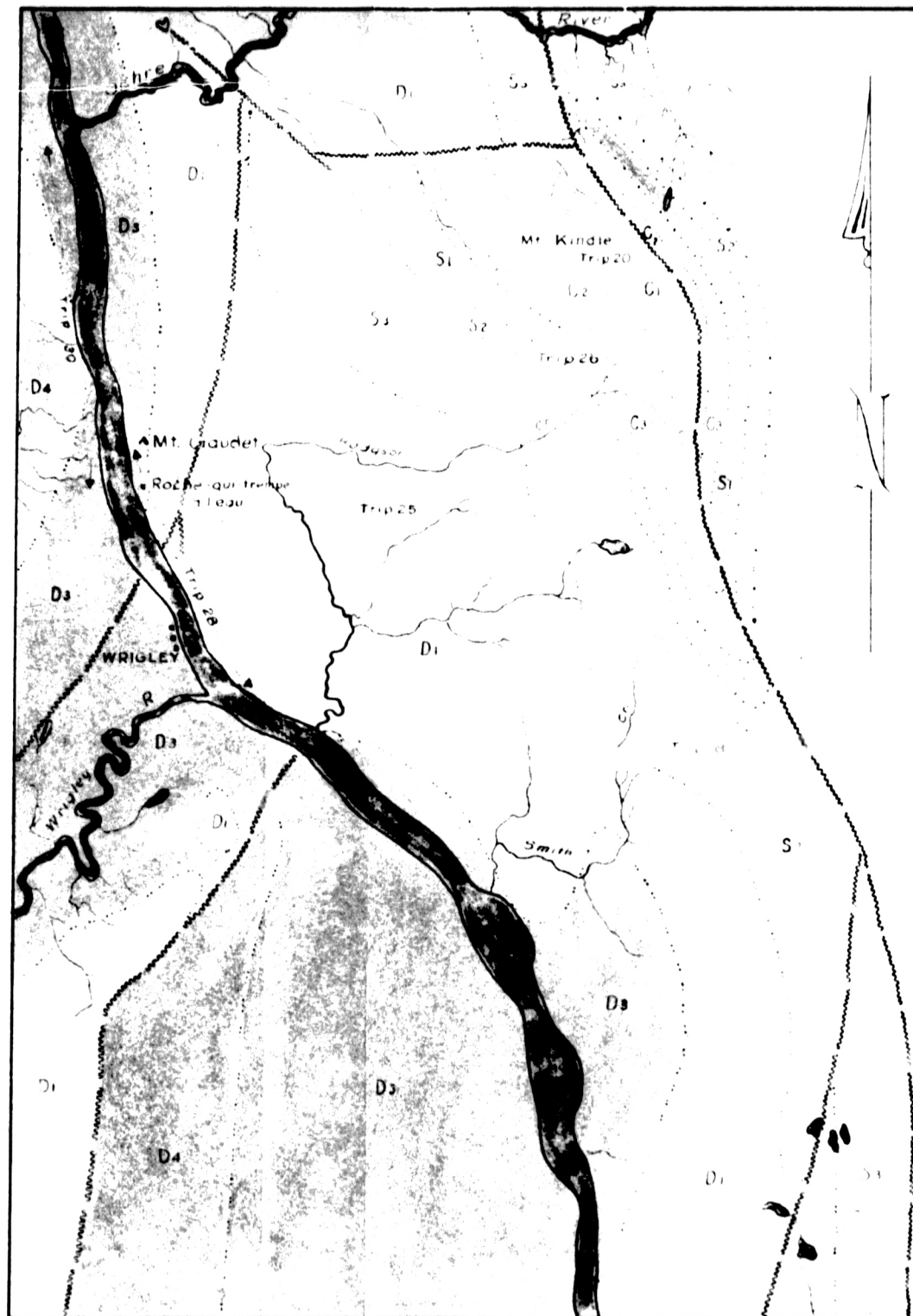
MAP NO. 3

SCALE 1 INCH = 4 MILES

1953

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LEGEND

UPPER DEVONIAN

Leiorhynchus (D4)

Simpson (D3)

MIDDLE DEVONIAN

Ramparts (D1)

SILURIAN

Lone Mt (S3)

Mt. Kindie (S2)

Franklin Mt (S1)

CAMBRIAN

Saline River (C3)

Mt. Cap (C2)

Mt. Clarke and
Lone Land

SYMBOLS

Geological Contact

Fault

HUDSON'S BAY OIL AND GAS COMPANY LIMITED

MAP SHOWING
WRIGLEY AREA, N.W.T.
LOCATIONS OF TRIPS 18, 20, 25, 26, 28 and 30
MAP NO 4
SCALE: 1 INCH = 4 MILES

1953

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LEGEND

Cretaceous (Undivided)
 Leiorhynchus Zone
 Simpson-Fort Creek

CRET [D4]
 U DEV [D4]

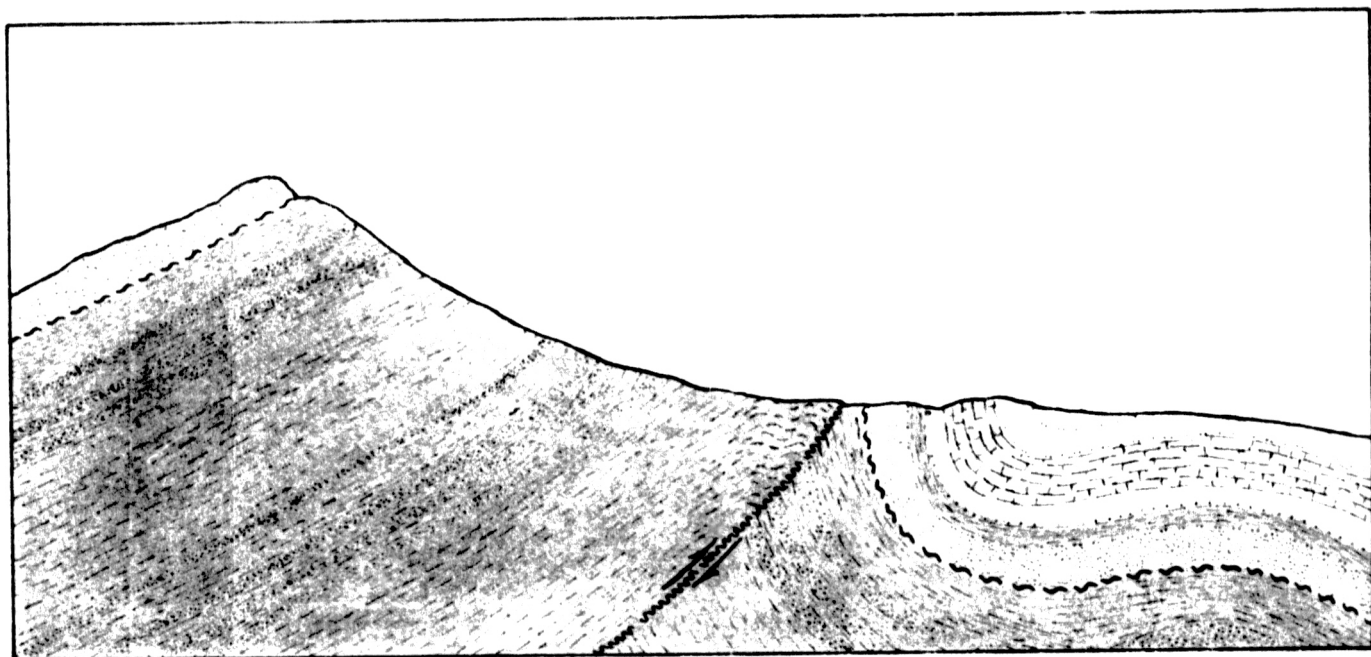


DAHADINNI RIVER AREA
 Scale: 1 inch = 4 Miles

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MAP SHOWING
 DAHADINNI RIVER AREA
 MAP NO 5

1953 G. DANN R49a



PROFILE OF MOUNT KINDLE NORTHWEST TERRITORIES

LEGEND

SILURIAN

Mt Kindle (S2)

Franklin Mt. (S1)

CAMBRIAN

Saline River (C3)

MT Cap (C2)

Mt Clarke and
Lone Land

Unconformity

Fault

Sandstone

Limestone

Shale

CROSS SECTION THROUGH
MOUNT KINDLE
MAP NO 6
SCALE: 1 INCH = 4 MILES

1953

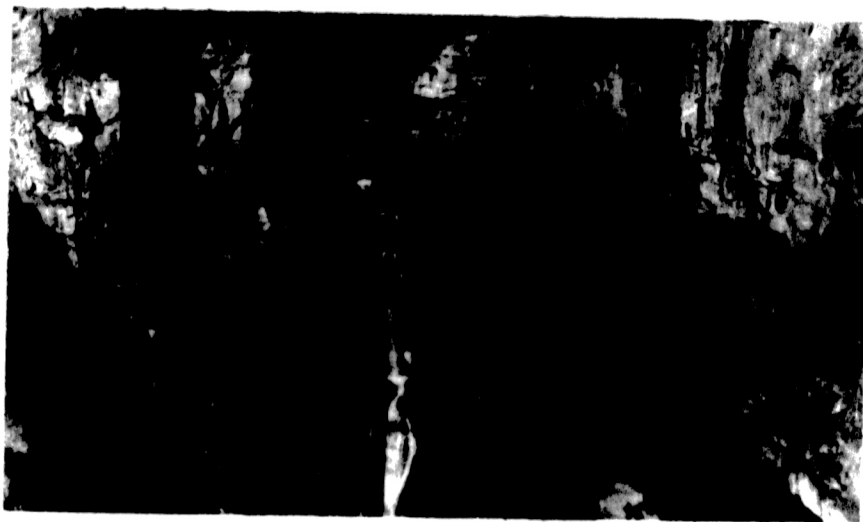
G DANN

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PLATE I

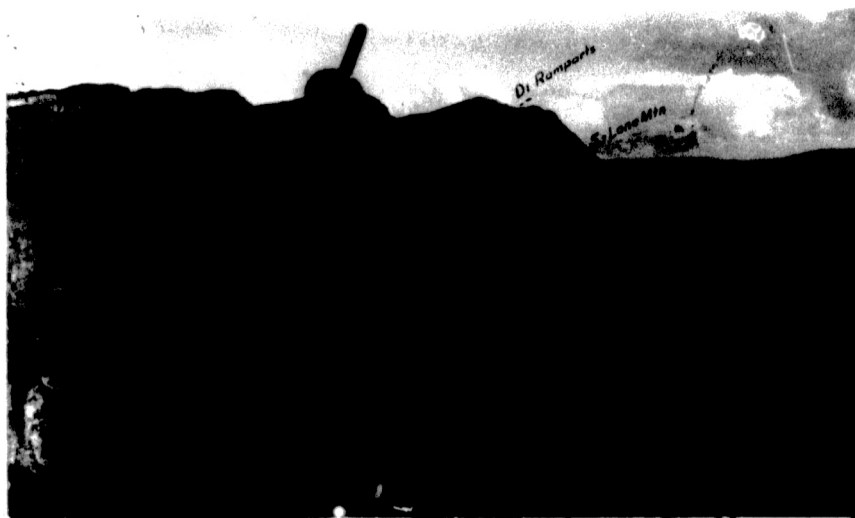


A. Helicopter taking off near Upper Devonian D5 Section,
North Nahanni River.



B. Middle Devonian Limestone, North Nahanni River.

PLATE 2



A. Front scarp of Camsell Range showing Lone Mountain and Ramparts Formations thrust over Upper Devonian strata.

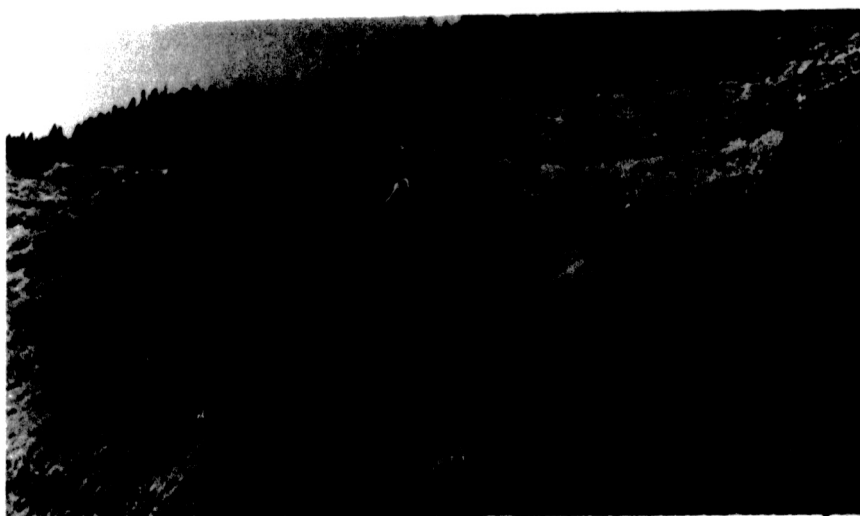


B. Folded Middle Devonian strata, Camsell Range.

PLATE 3

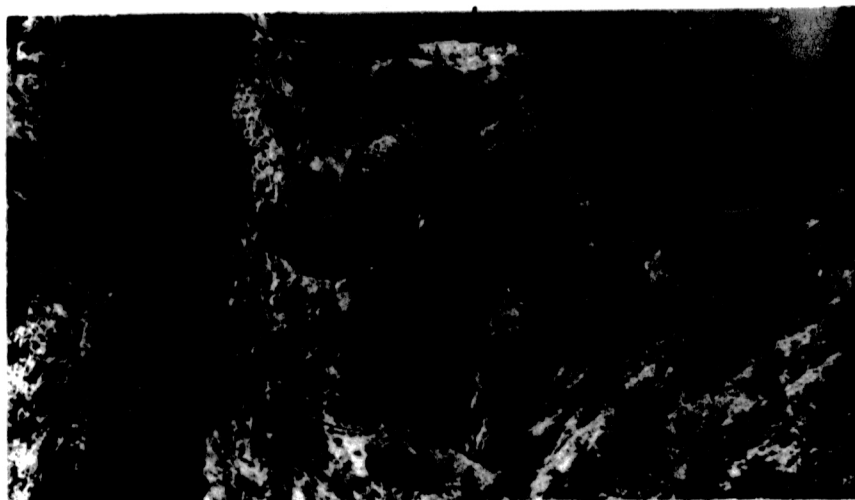


A. Upper Devonian Section, North Nahanni River.



B. Upper Devonian D5 Shale Section, North Nahanni River.

PLATE 5

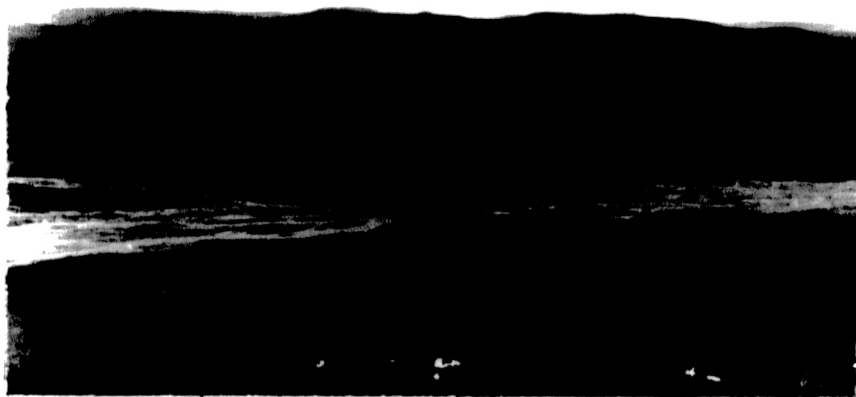


A. Dolomite breccia in the Bear Rock Formation, Franklin Mountains.



B. Sinkhole in Middle Devonian limestone near Franklin Mountains.

PLATE 4



A. Upper Devonian of the D3 Formation overlying Middle Devonian limestone, North Mahanni River.



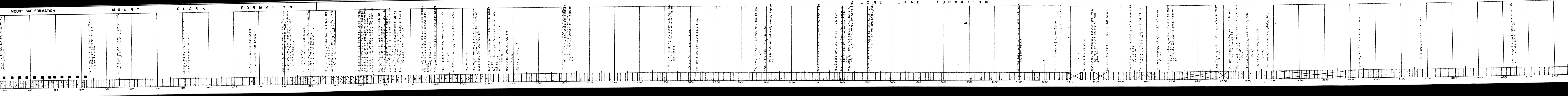
B. Crumpled Upper Devonian Shales of the D7 Formation below the Camsell Fault.

R49S2

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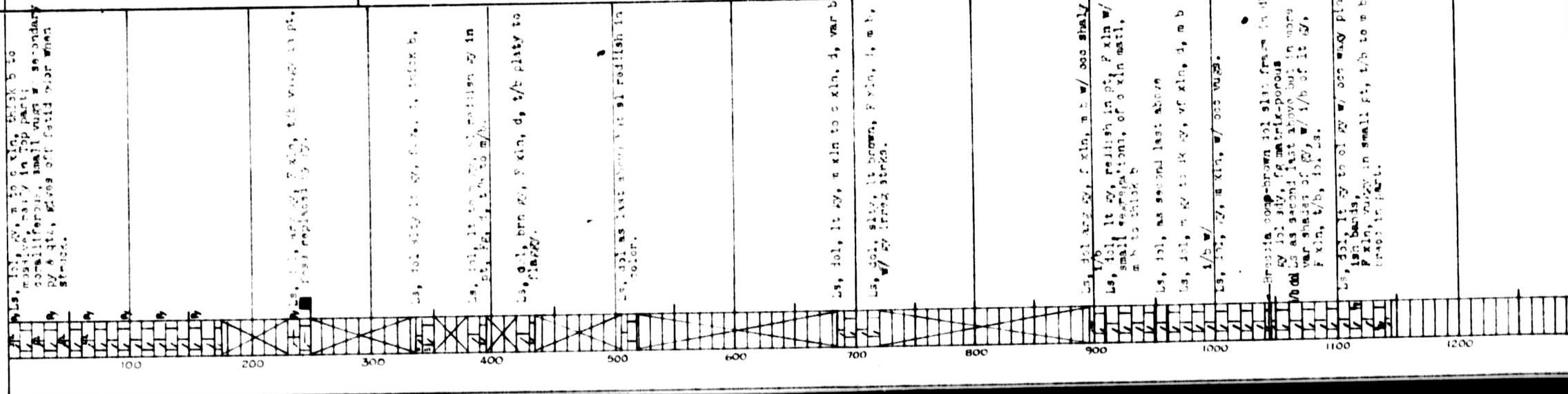
COMPANY

GEORGE DANN

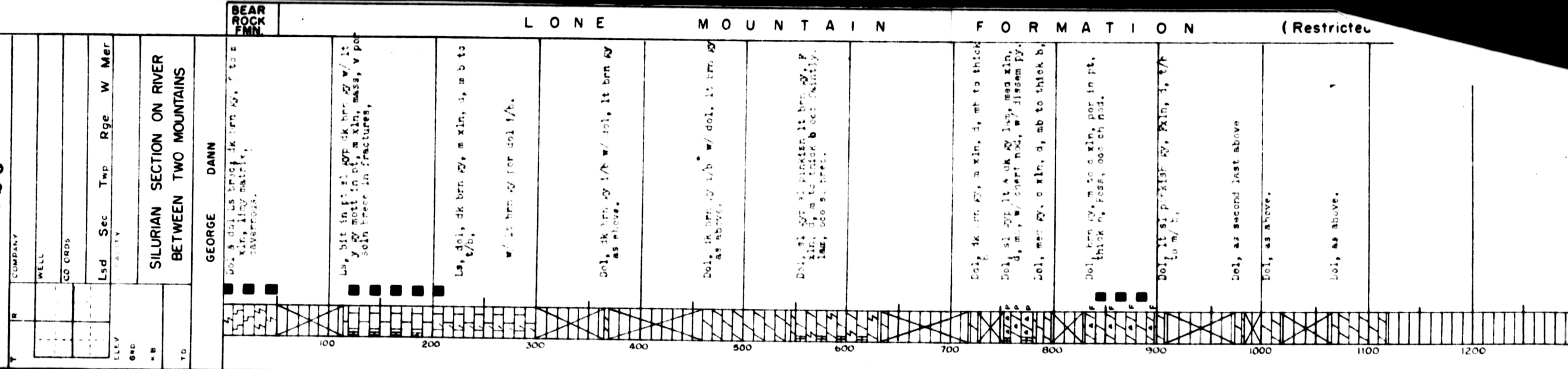
SILURIAN SECTION
FRANKLIN MOUNTAINS

MT KINDLE FORMATION

FRANKLIN MOUNTAIN FORMATION



R 49S6



R 49 S 7

